

The invention in which an exclusive right is claimed is defined by the following:

1. A method of constructing a library of optically distinct reporter labeled carriers, said method comprising the steps of:

- (a) providing a plurality of carriers;
- (b) providing a plurality of reaction vessels, such that at least one reaction vessel is available for each unique member of the library to be constructed;
- (c) providing a plurality of optically distinct reporters;
- (d) in each reaction vessel, apportioning at least one carrier and at least one reporter in a predetermined unique combination; and
- (e) attaching said at least one reporter to said at least one carrier in each reaction vessel, by at least one of a physical attachment and a chemical attachment.

2. The method of Claim 1, wherein at least one reaction vessel contains a carrier that is optically distinct from others of said plurality of carriers in other reaction vessels, and wherein no reaction vessel contains a mixture of optically distinct carriers.

3. A method of constructing a library of reporter labeled carriers, said method comprising the steps of:

- (a) providing a plurality of singly labeled micro-particles, each singly labeled micro-particle comprising a uniquely identifiable characteristic;
- (b) determining a number of unique reporters required to completely encode a desired bead library, based on the uniquely identifiable characteristics of said plurality of singly labeled micro-particles;
- (c) providing a plurality of separate reaction vessels, including one reaction vessel for each unique reporter signature required;
- (d) apportioning said singly labeled micro-particles among the plurality of reaction vessels, such that each reaction vessel contains at least one singly labeled micro-particle required to generate a unique reporter signature associated with that reaction vessel;
- (e) for each reaction vessel requiring additional singly labeled micro-particles to generate a unique reporter signature associated with that reaction vessel, adding appropriate singly labeled micro-particles having a complementary chemistry until substantially all singly labeled micro-particles in that reaction vessel have combined; and

(f) repeating step (e) in a stepwise fashion until each reaction vessel contains either a singly labeled micro-particle having a unique reporter signature associated with that reaction vessel, or a combination of singly labeled micro-particles having a unique reporter signature associated therewith.

4. The method of Claim 3, wherein said micro-particle comprises one of a quantum dot and a micro-bead.

5. The method of Claim 3, wherein the uniquely identifiable characteristic comprises color.

6. The method of Claim 3, further comprising the step of using a contents of each reaction vessel to combinatorially generate said desired labeled bead library.

7. The method of Claim 3, further comprising the step of selecting the micro-particles so as to ensure that a size of a combination of singly labeled micro-particles required to generate a unique reporter signature associated with a specific reaction vessel is no larger than a resolution limit of an imaging system selected to read said desired bead library.